

REMARKS

Claims 1-11 are pending in the application. Claims 1-10 have been amended, and claim 11 is newly added to the application. No new matter has been introduced by the amendment.

Specification

The applicants note that the section headings included in their Preliminary Amendment did not appear in U.S. Patent Publication No. 2006/0183060. The applicants respectfully request that the section headings be entered in their application specification.

Rejection Under 35 U.S.C. § 103(a)

Claims 1-5 and 8-10 have been rejected over Chou. This rejection is overcome in view of the amendment of claim 1 together with the following remarks.

Claim 1 recites a lithographic method that includes forming a composite layer on a substrate. Forming the composite layer includes forming an internal sub-layer of curable material and curing the internal sub-layer. Forming the composite layer also includes forming an external sub-layer adjacent to the cured internal sub-layer. Claim 1 further recites pressing a mold, wherein protrusions of the mold penetrate into the external sub-layer until the protrusions contact the internal sub-layer. Further, at least one etching process is performed in which the composite layer is etched until portions of a surface of the substrate have been exposed. The substrate is then etched using an etching pattern defined by the mold pattern. The applicants assert that the lithographic method recited by claim 1 is not suggested or disclosed by Chou.

The process of Chou differs from the applicants' claimed method in that Chou forms a single thin film (20) on the surface of a substrate (18). A mold (10) is then pressed into the thin film to form compressed portions (24). The compressed portions are subsequently removed to expose the underlying substrate. The applicants assert that their claimed method substantially differs from the process disclosed by Chou. By providing a composite layer that includes internal and external sub-layers, numerous process advantages are realized. Indeed, the applicants discuss the process of Chou,

as reported by Chou in a technical publication published on the same day as Chou's patent application filing date. (See paras. 0006 – 0013). In their specification, the applicants point out that the technique disclosed by Chou suffers from poor uniformity and difficulty controlling lateral dimensions across the patterned substrate. Because thickness differences can exist in this prior art process, the subsequent oxygen plasma etching step is difficult to control, leading to variations in pattern dimensions. The thickness variations are believed to arise from extreme sensitivity to pressing pressure, temperature, and pressing time. The process sensitivity to pressing parameters makes the process difficult to control.

The applicants assert that their claimed process overcomes the disadvantages of Chou by providing a composite layer in which the internal sub-layer functions as a stopping layer during the mold pressing operation. (See para. 0042). In view of the failure of Chou to suggest or disclose the process improvement obtained by the applicants' composite layer and, in particular, the formation of a cured, sub-layer, the applicants assert that claim 1 is not obvious in view of Chou.

Claim 2 has been amended to correspond with amended claim 1. Claim 2 recites forming the internal sub-layer in contact with the substrate surface, and etching regions of the internal sub-layer defined by recesses formed in the external sub-layer. The etching process etches regions of the substrate exposed by the recesses. The applicants assert that Chou does not suggest or disclose the process of claim 2, at least because Chou fails to suggest or disclose removing an internal sub-layer, followed by etching regions of the substrate.

Claim 3 is allowable at least in view of its dependence from claim 1. Further, applicants disagree with the Examiner's characterization of Chou as disclosing more than a single thin film (20). The heating step disclosed by Chou at Col.4, ll. 50-55 describes the heating of the thin film at a temperature sufficient to soften the film. The heating process softens the entire single thin film. The applicants assert that Chou does not suggest or disclose the formation of two sub-layers and, in particular, the curing of the inner most sub-layer.

Claim 4 is allowable at least in view of its dependence from claim 1. Further, claim 4 recites heating the internal sub-layer to cure the sub-layer at a temperature

higher than its curing temperature. Claim 4 further recites pressing the mold at a pressing temperature higher than the glass transition temperature of the external sub-layer. The applicants assert that claim 4 relates to processing parameters of two different layers, the internal sub-layer and the external sub-layer. The applicants assert that claim 4 is not obvious in view of Chou, at least because Chou fails to suggest or disclose processing with respect to physical parameters of two separate layers.

Claims 5 and 8-9 are allowable over Chou at least in view of their dependence from claim 1. Further, these claims have been amended to maintain correspondence with amendments to claim 1.

Claim 6 has been rejected over Chou in view of Pavlinec et al. This rejection is overcome in view of the amendment and remarks pertaining to claim 1, from which claim 6 depends. Further, the applicants assert that the addition of Pavlinec et al. does not overcome the deficiencies of Chou. Neither reference suggest or discloses the formation of a composite layer and the curing of an internal sub-layer, followed by pressing protrusions of a mold into the external sub-layer until the protrusions contact the underlying internal sub-layer.

Claims 7 and 10 have been rejected over Chou in view of Pavlinec et al. and Allen et al. This rejection is overcome in view of the applicants' foregoing remarks pertaining to claim 1, from which claims 7 and 10 depend. The Applicants assert that the disclosure of various characteristics of resist materials by Allen et al, and the disclosure of cross-linking polymers by Pavlinec et al, do not overcome the deficiencies of Chou. This is at least because none of the cited references, taken alone or in combination, suggest or disclose the applicants lithographic method recited by claim 1.

The additionally cited reference to Tavkhelidze has been carefully examined and found not to be relevant to the applicants' pending claims.

New Claims

Claim 11 has been newly added to the application in order that the applicants may more fully claim the subject matter of their invention. Claim 11 recites a lithographic method that includes forming a first layer comprising a curable material, and curing the first layer. A second layer is formed on the first layer. The second layer

comprises a deformable material, and a mold is pressed against the second layer. Protrusions in the mold form recesses in the second layer that expose portions of the first layer. The first layer is etched using the second layer as an etch mask, and the etch exposes surface regions of the substrate. The surface regions of the substrate are then etched. The process recited in claim 1 is illustrated in the applicants' drawing in FIGS. 1-4.

The applicants assert that the cited references do not suggest or disclose the lithographic method recited by claim 11. None of the cited references suggest or disclose a deformable layer overlying a cured layer, in which a mold is pressed to form recesses in the second layer, and an etching process is carried out to etch the cured second layer and the underlying substrate.

The applicants have made a contribution to the art of lithographic methods. The claims at issue distinguish over the cited references and are in condition for allowance. Accordingly, such allowance is now earnestly requested.

Respectfully submitted,

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